DOCUMENT RESUME

ED 334 408 CE 058 426

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TITLE Using the Holland Occupational-Environmental Classification in Research and Practice.
PUB DATE Apr 91
NOTE 41p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, April 1991).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Career Choice; Career Planning; *Classification; *Congruence (Psychology); *Environmental Influences; Individual Differences; *Industrial Psychology; Job Satisfaction; Psychological Studies; Research and Development; *Work Environment
IDENTIFIERS Dictionary of Occupational Titles; *Hollands Theory of Occupational Choice; Position Classification Inventory

ABSTRACT

The occupational-environmental typology (Holland, 1985) is based on a theory of persons and work environments. The theory uses a classification of persons and work environments to describe differences and similarities. The theory explains career choice and persistence, attraction and retention of workers, job satisfaction, and environmental quality. Individuals and work environments can be described by their degree of resemblance to Holland's six personality types: realistic, investigative, artistic, social, enterprising, and conventional. A secondary concept describes the resemblance of a work environment or person to one or all six types. Congruence between an environment and the workers this environment recruits should lead to a productive and well-ordered environment. Environmental classification has been used to organize information about occupations, such as in the Dictionary of Occupational Titles and the Position Classification Inventory. The typology has been applied to environments other than occupations, such as organizations, spouses, clients, and roommates. Classification in research is organized in three categories: information about career trajectories, the concomitants of person-job match, and the relationship of the classification to other systems. (Twenty figures, 9 tables, and 60 references are included.) (NLA)

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Using the Holland Occupational-Environmental Classification in Research and Practice

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April 1991

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Invited address prepared for presentation at the annual meeting of the American Educational Research Association, Chicago, April 1991. Portions of the material presented here were initially prepared for the ***Manual for the Position Classification Inventory*** (Gottfredson & Holland, in press). I am grateful for the counsel of John L. Holland on the manuscript.

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Using the Holland Occupational-Environmental Classification in Research and Practice

My aim today is to summarize some of what is known about the Holland environmental typology. I will illustrate its uses in research and practice, review some evidence for its validity, and provide you with a brief intellectual history of the evolution of the classification. I hope to provide an overview that is useful to those encountering the typology for the first time as well as for those who are experts in applications and research.

My talk is organized as follows: (1) What is it? I will describe the typology so that those in the audience who are new to the theory have an orientation and so that experienced users are reminded of its nature. (2) How has it been used? I will illustrate the practical utility of the occupational-environmental classification in both practice and research to convey a concrete account of the broad range of applications. (3) How did it arrive at its current status? I will explain how the classification evolved between 1959 and 1991 to provide you with a tour of origins, operationalization, and new instrumentation.

I expect to have more time to talk than you will want to listen. Fortunately, Laurel Oliver will rescue the program by correcting my biases and providing you with an entertaining critique. We have planned the session to allow time for audience participation--questions, answers, criticisms, observations, and advice--when the formal remarks are finished.

What It Is

The occupational-environmental typology is based on a theory of persons and work environments (Holland, 1985a). The theory uses a classification of persons to describe and explain individual differences and similarities, and a classification of work environments to describe and explain differences and similarities among positions and occupations. The theory uses both classifications and a small number of additional concepts to explain career choice and persistence, attraction and retention of workers, job satisfaction and environmental compatibility.

Persons

People can be described by their degree of resemblance to six theoretical personality ***types*** labeled Realistic, Investigative, Artistic, Social, Enterprising, or Conventional. Each type is characterized by distinctive preferences, outlooks, competencies, and self-perceptions. In practical application, information about a person's preferences, outlooks, competencies, and self-estimates is used to assess the degree to which an individual resembles each of the six personality types. The ***Self-Directed Search*** (Holland,

1985c) is the most direct implementation of the theory for classifying individuals, although a number of other inventories also aim to implement the theory.

The six personality types are briefly described in Figure 1. These ideal personality types are used to describe the similarity of any particular individual to one or more of these stereotypical abstractions.

Environments

The personality types are paralleled by six model environments which are also used to describe the resemblance of specific work environments to stereotypical abstractions. Today I will focus on the environmental typology--the salient features of which are summarized in Figure 2.

Realistic. The Realistic model environment requires manual and mechanical competencies and interaction with machines, tools, and objects. It rewards the display of practical, mechanical, technical, and physical abilities. The Realistic model environment allows the expression of practical, productive, and concrete values and robust, adventurous, and risky personal styles. This environment demands and rewards conforming behavior and practical accomplishment. Occupations classified as Realistic tend to involve concrete and practical activity and the use of machines, tools, or materials.

Investigative. The Investigative model environment requires analytical, technical, scientific, and verbal competencies. It rewards the display of skepticism and persistence in problem solving, the achievement or documentation of new knowledge, or the understanding or solution of practical and technical problems. Occupations classified as Investigative tend to involve analytical or intellectual activity aimed at problem-solving, trouble-shooting, or the creation and use of knowledge.

Artistic. The Artistic model environment requires innovation or creative ability. It rewards the display of imagination in literary, artistic, or musical accomplishments, and allows the expression of unconventional ideas or manners. Occupations classified as Artistic generally involve creative work in the arts: music, writing, performance, sculpture, or other relatively unstructured and intellectual endeavors.

Social. The Social model environment requires interpersonal competencies and skill in treating, healing, or teaching others. The Social environment allows the expression of empathy and humanitarianism. It rewards the expression of concern for the welfare of others. Occupations classified as Social typically involve working with people in a helpful or facilitative way.

Figure 1: A Brief Description of the Personality Typology

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Preferences for activities and occupations	Manipulation of machines, tools and things	Exploration, understanding and prediction or control of natural and social phenomena	Literary, musical, or artistic activities	Helping, teaching, treating, counseling, or serving others through personal interaction	Persuading, manipulating, or directing others	Establishing or maintaining orderly routines, application of standards
Values	Material rewards for tangible accomplishments	Development or acquisition of knowledge	Creative expression of ideas, emotions, or sentiments	Fostering the welfare of others, social service	Material accomplishment and social status	Material or financial accomplishment and power in social, business, or political arenas
Sees self as	Practical, conservative, and having manual and mechanical skills -- lacking social skills	Analytical, intelligent, skeptical and having academic talent -- lacking interpersonal skills	Open to experience, innovative, intellectual -- lacking clerical or office skills	Empathic, patient, and having interpersonal skills -- lacking mechanical ability	Having sales and persuasive ability -- lacking scientific ability	Having technical skills in business or production -- lacking artistic competencies
Others see as	Normal, frank	Asocial, intellectual	Unconventional, disorderly, creative	Nurturant, agreeable, extroverted	Energetic, gregarious	Careful, conforming
Avoids	Interaction with people	Persuasion or sales activities	Routines and conformity to established rules	Mechanical and technical activity	Scientific, intellectual, or abstruse topics	Ambiguous or unstructured undertakings

Figure 2: A Brief Description of the Environmental Typology

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Requires	Manual and mechanical competencies, interaction with machines, tools, and objects	Analytical, technical, scientific, and verbal competencies	Innovation or creative ability, emotionally expressive interaction with others	Interpersonal competencies, skill in mentoring, treating, healing, or teaching others	Skills in persuasion and manipulation of others	Clerical skills, skills in meeting precise standards for performance
Demands and rewards the display of	Conforming behavior, practical accomplishment	Skepticism and persistence in problem solving, documentation of new knowledge, understanding or solution of problems	Imagination in literary, artistic or musical accomplishment	Empathy, humanitarianism, sociability, friendliness	Initiative in the pursuit of financial or material accomplishment; dominance; self-confidence	Organizational ability, conformity, dependability
Values or personal styles allowed expression	Practical, productive and concrete values; robust, risky, adventurous styles	Acquisition of knowledge through scholarship or investigation	Unconventional ideas or manners, aesthetic values	Concern for the welfare of others	Acquisitive or power-oriented styles, responsibility	Conventional outlook and concern for orderliness and routines
Occupations or other environments involve	Concrete, practical activity; use of machines, tools, materials	Analytical or intellectual activity aimed at trouble-shooting or creation and use of knowledge	Creative work in music, writing, performance, sculpture, or unstructured intellectual endeavors	Working with others in a helpful or facilitative way	Selling, leading, manipulating others to attain personal or organizational goals	Working with things, numbers, or machines to meet predictable organizational demands or specified standards
Sample occupations	Carpenter, truck operator	Psychologist, microbiologist	Musician, interior designer	Counselor, clergy member	Lawyer, retail store manager	Production editor, bookkeeper

Enterprising. The Enterprising model environment requires skills in the persuasion and manipulation of other people. It allows the expression of acquisitive or power-oriented personal styles. It rewards initiative in the pursuit of financial or material accomplishment. Occupations classified as Enterprising tend to involve working with people in a supervisory or persuasive way to achieve some organizational goal.

Conventional. The Conventional model environment requires clerical skills or skills in meeting precise standards for performance. It allows the expression of a conventional outlook and a concern for orderliness and routines. It rewards organizational ability, conformity, and dependability. Occupations classified as conventional typically involve working with things, numbers, or machines in an orderly way to meet the regular and predictable demands of an organization or to meet specified standards.

Describing Persons and Work Environments Using the Typologies

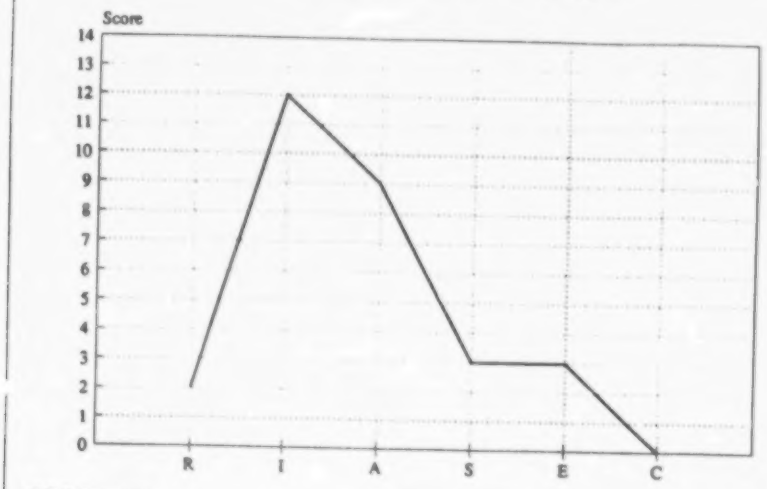
In practical application, individuals are described according to their degree of resemblance to the six ideal personality types. The ***Self-Directed Search*** or the ***Vocational Preference Inventory*** are used to assess the degree of resemblance of a person to the six personality types. Figure 3 shows my VPI profile, implying that I most resemble the Investigative type, Artistic next, and Conventional least. The categories into which a person's expressed occupational aspirations or history of employment fall are also sometimes used to estimate the resemblance of a person to the six ideal types.

Work environments are described according to their degree of resemblance to the six ideal environmental types. Several methods are used to assess the degree of resemblance of a position or occupation to the model environments. Occupations were originally classified according to the inventoried interests of persons employed in or aspiring to them (Holland, 1973, 1975). More recently, occupations have been classified by using job analysis data (Gottfredson & Holland, 1989). The ***Position Classification Inventory***--a structured job analysis inventory--is the newest method for identifying occupations according to the theoretical classification, and it is the method that most directly applies the theoretical formulations to implement the classification.

Any particular occupational environment will show a profile of resemblance to the six ideal types. For example, the profile for experimental psychologist shown in Figure 4 implies that this occupation most resembles the Investigative environmental model, followed by Artistic. This profile is based on job descriptions by ten incumbents. In most applications, a one- to three-letter code describes the types an environment most resembles. By convention, the first letter denotes the environmental model resembled most, the second letter denotes the type next most closely resembled, and so on. By use of two- or three-letter codes, the six main categories are divided into a larger number of subcategories.

Figure 3.

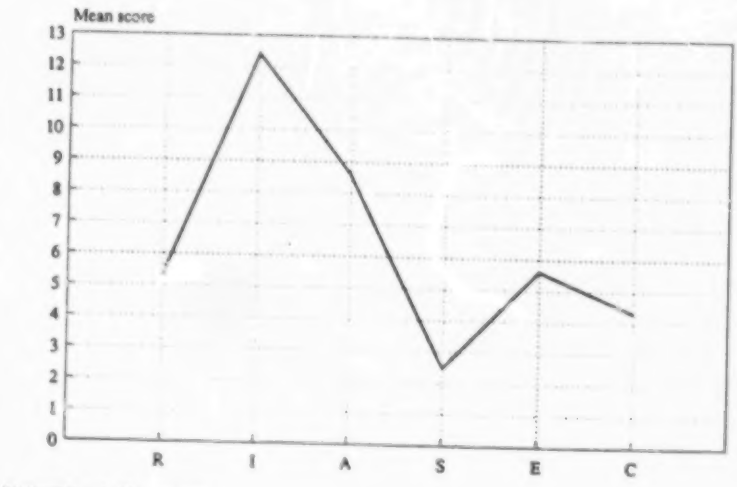
A VPI Profile Assessing the Resemblance of a Person to the Six Personality Types



G. D. Gottfredson, 1991

Figure 4.

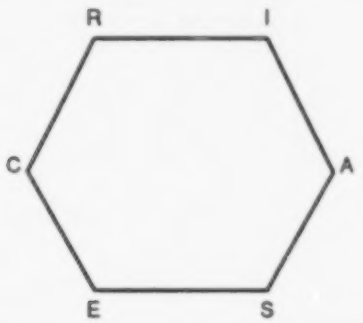
Position Classification Inventory
Experimental Psychologist



Job descriptions by 10 incumbents

Certain environmental models are more closely related than are others; similarly, certain personality types are more closely related than are others. These degrees of resemblance are summarized by the hexagonal arrangement in Figure 5. Theoretically, distances on the hexagonal model are inversely proportional to the resemblances among the types. For example, a Realistic occupation is more closely related to a Conventional or an Investigative occupation than it is to a Social occupation. Environments opposite each other on the hexagon are most distinct from one another. The Realistic environment often involves work with machines or tools whereas the Social environment involves work with people rather than tools or machines. The Investigative environment requires skepticism and analytical skill, whereas the Enterprising environment requires persuasiveness and self-assurance. The Artistic environment requires creativity, whereas the Conventional environment rewards orderliness and the application of established rules or standards for performance.

Figure 5. A Hexagon Summarizing Relations Among Environmental and Personality Types

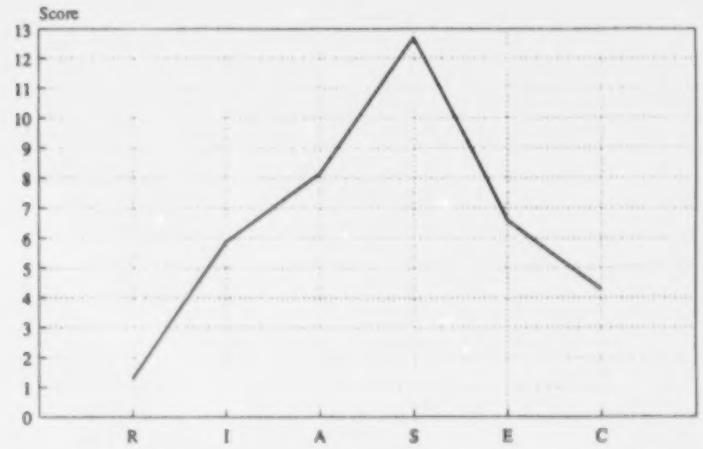


The secondary concept of ***differentiation*** is used to describe the extent to which an assessment implies a marked resemblance of a work environment or person to one of the types, or whether the environment or person resembles all six types to approximately the same degree. At one extreme, a highly differentiated or defined assessment profile implies a strong resemblance to one type and little resemblance to the remaining types. The PCI profile for counselor illustrated in Figure 6 is a well defined environmental profile--it most closely resembles the Social environmental model, resembles the hexagonally adjacent Artistic and Investigative environmental types next, and shows little resemblance to the Realistic model.

At the other extreme, an undifferentiated assessment profile implies approximately equal resemblance to all environmental models. This (Figure 7) profile for musical instrument repairer is an example of an undifferentiated profile. This environment requires working with tools and things (R) to solve problems (I), related to music (A), to help instruments' owners (S), while operating an independent business (E), and keeping records (C). The simplest method of indexing differentiation is by the arithmetic difference be-

Figure 6.

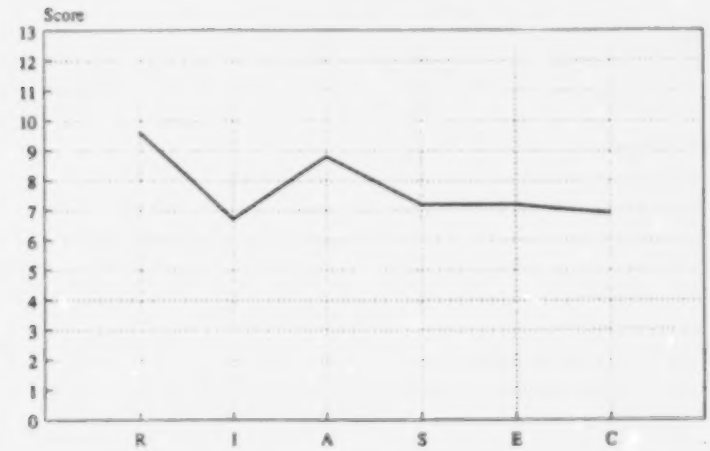
Position Classification Inventory
Counselor



N = 22 Differentiation = 2.84

Figure 7.

Position Classification Inventory
Musical Instrument Repairer



N = 10 Differentiation = .80

tween the highest and lowest scores in a profile (Holland, 1985a). An alternative method, which is more sensitive to the differences among the highest scores in a profile has been proposed by Iachan (1984a). Research has not demonstrated either index to be superior.

Person-Environment Interactions

Congruence between a person and a work environment is expected to go with satisfaction and persistence in the environment. Individuals seek and remain in congruent environments, and environments recruit, retain, and reward congruent people. Congruence is assessed by using the hexagonal model (Figure 5 again). A Realistic person in a

Realistic occupation is most congruent, and a Realistic person in a Social environment is least congruent. Intermediate distances according to the hexagon imply intermediate degrees of congruence.

Other things being equal, an Investigative individual is expected to seek, be satisfied in, and to remain in an Investigative environment. In contrast, an Investigative individual is expected to avoid, be dissatisfied in, and to leave an Enterprising environment. These outcomes are expected because an Investigative environment provides opportunities for the expression of and rewards analytical competencies and a skeptical outlook, whereas an Enterprising environment fails to reward these personal characteristics and instead requires self-assurance and persuasive ability.

A number of alternative methods of assessing person-environment congruence have been proposed.[1] These alternatives make use of information about a person's pattern of resemblance to two or more types and an environment's pattern of resemblance to two or more models, and they have generated a small amount of comparative research[2]

How the Classification Has Been Useful

Now I want to provide you with illustrations of some of the many ways the environmental classification has been used in research and application. A good classification *is* a good theory, and a good theory is recognized through the applications it generates. I will describe some applications.

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[1] Gati, 1985; Iachan, 1984b, 1990; Kwak & Pulvino, 1982; Moody, 1983; Zener & Schnuelle, 1976.

[2] Rounds, Dawis, & Lofquist, 1987; Assouline & Meir, 1987. For more perspective on congruence and empirical evidence see Assouline & Meir (1987); Gottfredson and Holland (1990); Helms and Williams (1973); Holland (1985a); Mount and Muchinsky (1978); Muchinsky and Monahan (1987); Osipow (1987); Spokane (1985); Swaney and Prediger (1985); and Wiggins, Moody and Lederer (1983). An annotated bibliography (Holland & Gottfredson, 1990) provides users with access to research and illustrative applications pertaining to all parts of the theory.

Classifying Occupations

The greatest use of the environmental classification has been the organization and use of information about occupations. All 13,000 occupations in the ***Dictionary of Occupational Titles*** and its supplements have been classified on the basis of job analysis data developed by the Labor Department (Gottfredson & Holland, 1989), making the voluminous information in the DOT accessible to counselors, clients, and researchers who use the classification. This translation from the DOT job analysis data to Holland occupational classification is a useful empirical approximation.

More recently, we have developed the ***Position Classification Inventory*** (PCI; Gottfredson & Holland, in press) to directly classify any position or occupation according to the theory. We used the theoretical descriptions of the environmental types together with other job analysis information to write items that represent the demands, rewards, activities, and opportunities to display styles or values characteristic of each environmental model. The PCI allows a user to describe any position or occupation in terms of a profile of resemblances to the six environmental types.

Here are PCI job analysis profiles for some education-related occupations. Figure 8 shows the profile for educational researcher.[3] In contrast, consider the profile for elementary teacher (Figure 9). These profiles summarize regularities in job demands, values and styles reinforced, and activities that help to explain why the educational research and educational practice environments attract and retain individuals with different predispositions and develop groups who often appear to be speaking different languages--despite their orientation to the common problem of pedagogy. One environment propagates educationalists and the other educators. The two environments are evidently quite different.

Other Environments

The typology has been applied to environments other than occupations: organizations, spouses, clients, roommates. Here are some examples.

Organizations. One productive application of the environmental classification has been the research on college environments. To provide you with an example of the power of the classification for understanding college environments, I will show you Figure 10 based on data from a report by Richards (n.d.). Richards tabulated the number of faculty representing each environmental type in the 55 agricultural universities of 17 na-

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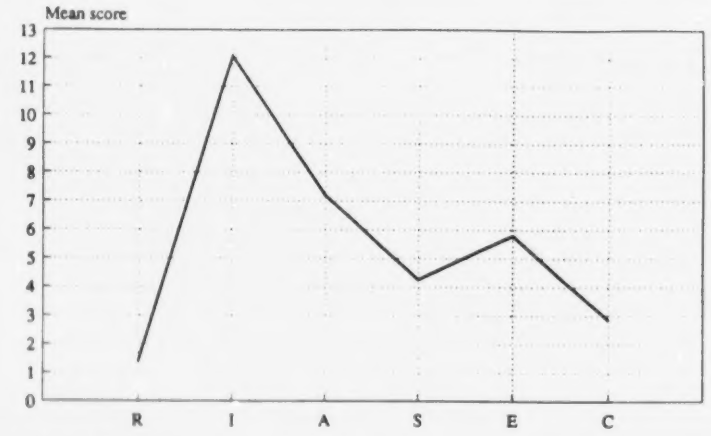
[3]Not necessarily representative of all educational researchers, this is the composite of job analysis data provided by 4 psychometricians, 3 developmental psychologists, 1 educational psychologist, and 22 social psychologists.

Figure 8.

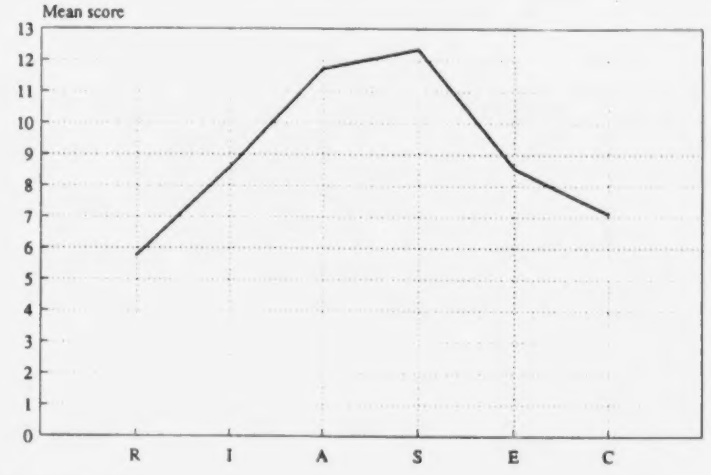
Position Classification Inventory
Educational Researcher



Job descriptions by 30 incumbents (Psychometricians; developmental, educational, social psychologists)

Figure 9.

Position Classification Inventory
Elementary School Teacher



N = 33 job descriptions

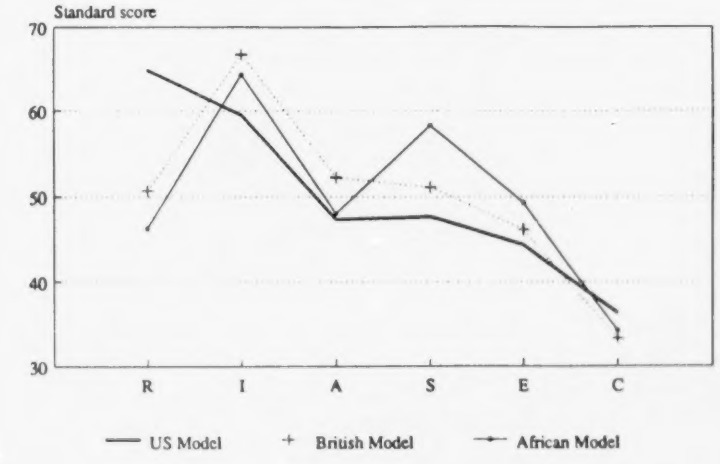
tions. He standardized for size of university by transforming the six Holland scores within nation to standard scores. Richards showed that agricultural universities in countries following a US model (NZ, Pakistan, India, US, Japan, Trinidad) are characterized by a Realistic-Investigative emphasis, whereas British-model agricultural universities (Ghana, Ireland, Australia, Britain, Zimbabwe, Sri Lanka, Nigeria, Canada, and South Africa) have a predominantly Investigative emphasis, and "African"-model agricultural universities (Uganda, Malaysia, Botswana, and Sierra Leone) are distinguished by Investigative-Social emphases. These environmental characterizations suggest a number of hypotheses about the likely outcomes of the divergent models of agricultural education.

Assessment of college environments has been useful in understanding or exploring the influences of these environments. For example, Astin (1965) showed that college students' career choices come to conform more and more to the dominant or modal career choice in their college environment. Hearn and Moos (1976) showed that the major field composition of a college living unit is related to the social climate of the environment. Richards (1987) examined the environments of predominantly black colleges and showed that social service environments were over-represented and that technical and managerial environments were under-represented (compared to the U.S. labor force), suggesting that black college environments may perpetuate the current distribution of occupations of African American workers.

Do you know what environmental pattern characterizes your institution? I found it instructive to examine my own organization by classifying its positions (excluding part-time students). The procedure is straightforward. I listed the positions of all persons employed, used the ***Dictionary of Holland Occupational Codes*** to assign a one-letter code to each, and examined the percentage distribution of codes. The result for my center in 1975 is shown in Figure 11. This appears to be the profile of a traditional, small behavioral science research and development (R&D) center. Investigative positions predominate, followed by Conventional positions (clerical and research support).

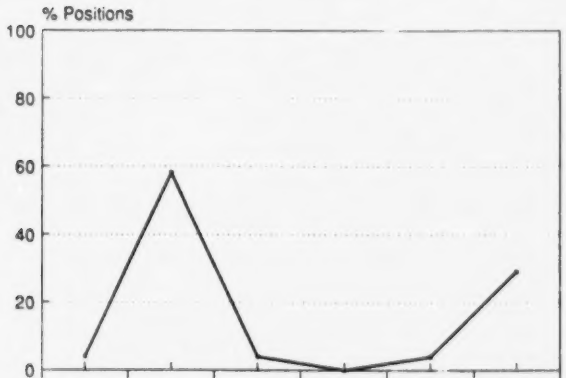
The center has grown and evolved over time so that it now resembles the research, development, and dissemination (RD&D) center shown by the dark line in Figure 12. The environment is no longer so dominated by Investigative work, and a substantial fraction of employees are involved in helping others utilize R&D products through training and dissemination activities. A broader range of individuals could probably find satisfying roles in the current organization than in the organization of a decade and a half ago. The demands and rewards of the environment shifted over the course of time: Whereas research, scholarship, and publication in the core scientific journals were the primary demands and rewarded activities at one time; training, dissemination, and publication in practitioner magazines are now an alternate set of demands or rewarded activities.

Figure 10. Mean Holland Scores for Agricultural Universities With Alternative Models



Richards (n.d.).

Figure 11. An Educational Research Center in 1975



	R	I	A	S	E	C
Percentage	4	58	4	0	4	29
N positions	1	14	1	0	1	6

N = 24 positions

Spouses, roommates, or "natural raters." An interesting possibility is to consider one person as an environment for another (an environment being a source of demands, rewards, opportunities). In this sense, a wife is an environment for a husband, roommates are environments for each other, a first-grade teacher is an environment for a pupil, and a supervisor an environment for a worker. These one-on-one relations should be extremely powerful environments when they are proximate sources of rewards, punishments, and clearly communicated demands. In many cases, an individual who is an "environment" in this sense is socially sanctioned as a "natural rater" -- a person with the authority to pass judgment on the role performance of the other person (Kellam et al., 1975). Unfortunately research on environments construed in this way seems limited to exploration of congruence between the personalities of dyads rather than involving independent attempts to assess environmental demands imposed by the parties to the interaction. Now that the PCI is available, it should be a straightforward matter to explore the implications of supervisors as environments for workers.

Environmental Classification in Research

I will organize some illustrations of the classification in research in three categories: organizing information about career trajectories, research on the concomitants of person-job match and mismatch, and research on the relation of the occupational-environmental classification to other environmental systems. Then I will summarize two recent research projects focused on recent tools for implementing the classification.

Organizing Aspiration and Work Histories

Theoretically, individuals will be attracted to and stay in occupations that are congruent with their personality dispositions. Therefore, one of the most straightforward ways to test the environmental classification is to determine whether it organizes information about the succession of occupations in which individuals are employed.[4] Just as some of the most impressive evidence of the usefulness of Roe's (1954) occupational classification came from a study of occupational mobility (Roe et al., 1966) the organization of mobility data according to the Holland occupational classification has provided impressive support for its validity. Roe et al. (1966) reasoned that transitions among occupations should most often be shifts from one occupation to another within the same category, and that transitions not within the same category should tend to fall in related categories according to her classification and circular ordering of categories.

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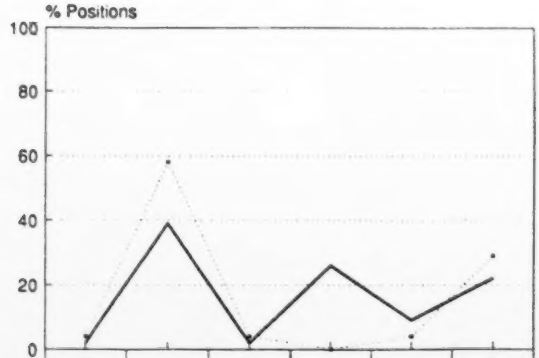
[4]Indeed, it has been suggested that occupational classifications be built to organize regularities in transitions among occupations on the grounds that this would group occupations making similar demands together. See Miller et al. (1980, pp. 206-213, 411-418) and Gottfredson (1982).

Figure 12.

An Educational Research Center 1975 and 1991

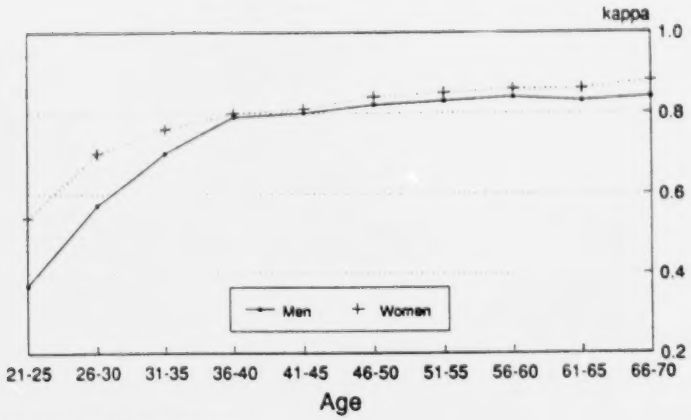


	R	I	A	S	E	C
1975 % (R&D) ·	4	58	4	0	4	29
1991 % (RD&D) —	2	39	2	26	9	22

1975 N = 24 positions
1991 N = 46 positions

Figure 13.

Agreement between Occupational Category 5 Yrs. Earlier and Current Category: Employed Civilians



N's for age-gender subgroups range from 1169 to 4271 except for workers over 65 where N's are 781 (men) and 353 (women).

I want to show you some of the evidence about the utility of the Holland occupational classification for organizing career data and share some insights into the nature of adult careers that are produced as a byproduct of validity tests. To do so, I must orient you to the way these data are summarized. In Table 1, I have assembled data--collected as part of the 1970 census of population--about the occupations of employed men at T_1 and 5 years later.[5] The table shows that of the 7571 men employed in Realistic occupations at the beginning of the 5-year period, 7009 (92%) were employed in a Realistic occupation at T_2. The bold face entries in the table show the number of men employed in the same occupational category at the two points in time. The table can be summarized by the percentage agreement -- the percentage of men employed in the same environmental category at both points in time (89%) and by coefficient kappa which represents the proportion of greater-than-chance-possible agreement that is observed (.82). I show you this table in part so that you get a sense what a table implying a kappa of .82 looks like. The same kind of data for a large sample of women is shown in Table 2. In all 88 percent of these women were employed in occupations in the same categories at two time points five years apart, and the kappa of .84 means that 84 percent of the greater-than-chance-possible agreement in categories at the two points in time was observed. A kappa of 0 would be obtained if the six-by-six cross classification of occupations at the two points in time were generated by chance alone.

I know that these cross-classification tables are often difficult for viewers to interpret, so let me show you the same data organized in a different way. Table 3 shows the ratio of observed to expected frequencies in each of the 36 cells generated by the 6 (T_1) by 6 (T_2) occupational categories for the career data for men. This table shows, for example, that 11.8 times as many men initially employed in Investigative occupations at T_1 were employed in Investigative occupations at T_2 as are expected by chance given the marginal distributions of employment at the two points in time. For men employed in Artistic work at T_1, 55 times as many are employed in Artistic work five years later than would be expected by chance alone. Parallel ratios for women are summarized in Table 4. The number of women employed in Realistic occupations at both T_1 and T_2 is 2.8 times greater than chance expectation.

A byproduct of this kind of test of the classification is the information displayed in Figure 13. Here I have graphed the kappas summarizing the agreement between category of occupations of men and women separated by five-year intervals for persons who had attained different ages in 1970. The large samples produce a regularity uncharacteristic of small-sample research, and the unusually smooth graphs for both men and women

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[5]These data were reported in a different form by Gottfredson (1977). Data to examine these career transitions were unfortunately not collected in the 1980 census. Therefore, the improvements in the occupational classification incorporated in the DHOC can not be examined with these large sample data.

Table 1

Category of Current Occupation by Category of Occupation 5 Years Earlier -- Men Aged 41-55 (N = 12,100)

Earlier category	Current category R	I	A	S	E	C
Realistic (R)	**7009**	104	9	55	317	77
Investigative (I)	57	**699**	4	13	49	5
Artistic (A)	6	4	**152**	1	14	2
Social (S)	37	18	7	**600**	37	17
Enterprising (E)	180	28	12	32	**1881**	58
Conventional (C)	56	12	4	10	54	**480**

Note. Percentage agreement = 89, kappa = .82.

Table 2

Category of Current Occupation by Category of Occupation 5 Years Earlier -- Women Aged 41-55 (N = 5,779)

Earlier category	Current category R	I	A	S	E	C
Realistic (R)	**1668**	5	1	51	58	121
Investigative (I)	1	**62**	0	5	2	7
Artistic (A)	0	1	**44**	2	5	2
Social (S)	32	6	8	**1072**	15	42
Enterprising (E)	30	0	0	20	**286**	46
Conventional (C)	88	6	3	38	75	**1977**

Note. Percentage agreement = 88, kappa = .84.

Table 3

Ratio of Observed to Expected Frequencies for 5-Year Transitions -- Men Aged 41-55 (N = 12,100)

Earlier category	Current category R	I	A	S	E	C
Realistic (R)	**1.5**	.2	.1	.1	.2	.2
Investigative (I)	.1	**11.8**	.3	.3	.3	.1
Artistic (A)	.1	.3	**54.7**	.1	.4	.2
Social (S)	.1	.4	.6	**14.3**	.3	.4
Enterprising (E)	.1	.2	.4	.2	**4.4**	.5
Conventional (C)	.1	.3	.4	.3	.5	**14.8**

Table 4

Ratio of Observed to Expected Frequencies for 5-Year Transitions -- Women Aged 41-55 (N = 5,779)

Earlier category	Current category R	I	A	S	E	C
Realistic (R)	**2.8**	.2	.1	.1	.4	.2
Investigative (I)	.0	**58.2**	.0	.3	.3	.2
Artistic (A)	.0	1.3	**84.1**	.2	1.2	.1
Social (S)	.1	.4	.7	**4.4**	.2	.1
Enterprising (E)	.2	.0	.0	.3	**9.8**	.3
Conventional (C)	.1	.2	.1	.1	.4	**2.4**

show increasing stability of careers through age 35, and a high degree of stability thereafter.

Results of a much more severe test of the ability of the occupational classification to organize information about career transitions are shown in Figure 14. This figure parallels the one I just showed you, but it is limited to employed workers who changed occupations. That is, all persons employed as carpenters (for example) both years are excluded. The figure shows that when men and women change occupations (not just jobs) they tend to change to other occupations in the same Holland occupational category. The kappas graphically displayed here imply that for women over age 30 about 40% of the greater-than-chance-possible agreement is observed; the corresponding kappas for men imply that about 30% of the greater-than-chance possible agreement is observed. Notice how stability is greater for older (over 30) than for younger workers.

Recall that occupational environments that are adjacent on the hexagon theoretically make similar demands on a person, and that occupational environments more distant make divergent demands. Accordingly, occupational environments such as IA which represent closely related environmental models will make convergent demands on a worker (in this case it would require investigative activities, reward curiosity, and allow expression of an intellectual style). In contrast an IE occupation would make contrasting or conflicting demands (for example, requiring both skepticism and persuasiveness). According to the theory, occupations resembling hexagonally related environmental models are expected to lead to stability, whereas occupations resembling hexagonally opposed environmental types are expected to lead to instability or the departure of individuals from the environment as they seek environments that are easier to cope with. Figures 15 (men) and 16 (women) show that inconsistent occupations (RS, IE, AC, SR, EI, CA) result in less career stability according to the classification than do consistent occupations. In every case for these large samples,[6] men and women initially employed in more consistent occupations show more career stability than those employed in inconsistent occupations (first two letters of the code representing hexagonally opposite environmental models).

Congruence Research

Another obvious way to test the validity of the environmental classification is to test the theoretical predictions about congruence, because congruence is the heart of any theory of person-environment match (Osipow, 1987). All matching models in vocational psychology, including the Holland theory, assume that if a person's abilities, interests, and personal traits match the requirements, rewards and opportunities of an work environment, the person will be satisfied and successful. Also implicit in matching models

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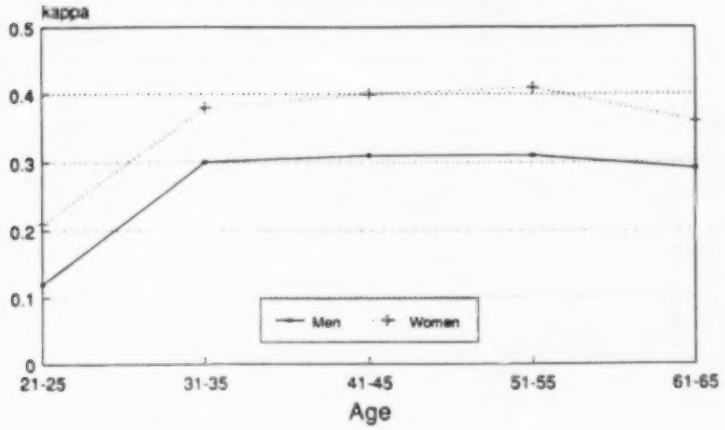
[6]These results were originally reported by Gottfredson (1977).

Figure 14.

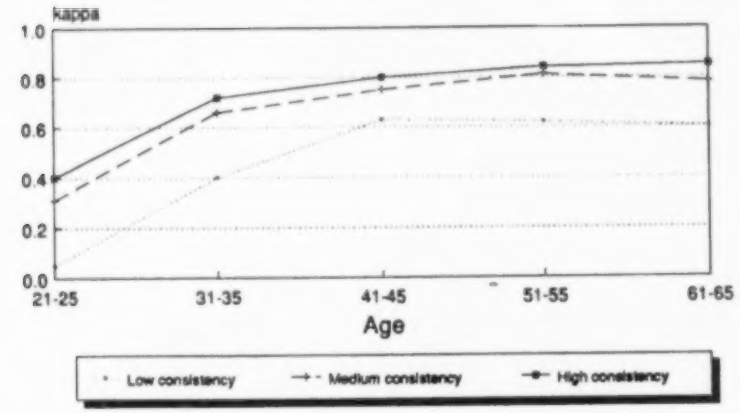
Agreement Between Category of Current Job and Job 5 Yrs. Earlier: Civilian Job Changers Only



Ns range from 209 to 1553 for age-gender subgroups.

Figure 15.

5-Yr. Categorical Stability of Men Whose Initial Jobs Were of Low, Medium, or High Consistency



Age-consistency subgroup N's range from 201 to 3166

although generally not made explicit, congruence between an environment and the workers the environment recruits should lead to a productive and well-ordered environment. Schneider (1987a, 1987b) came closest to making this outcome of person-environment match explicit.

The outcomes of tests of the congruence hypotheses have not always been positive, but they are characterized by generally positive results despite a host of problems with the research (Assouline & Meir, 1987; Borgen, 1986; Holland & Gottfredson, 1990, Gottfredson & Holland, 1990, Spokane, 1985). I will limit my illustrations of congruence research to a few of the better studies: a magnificent study of simulated work experiences, an important test of congruence hypotheses using a sample of employed workers, and studies taking advantage of naturally occurring interpersonal interaction outside of work environments.

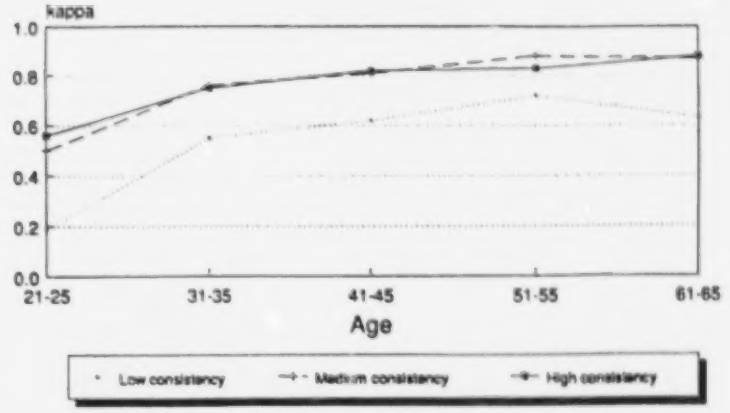
Simulated work experiences. A problem in doing research on person-work environment match is that as a result of self-selection and selection by others, persons are not randomly distributed across environments. Individuals tend to occupy congruent environments. The obstacles to randomly assigning work representing the six environmental models to individuals representing the six personality types are obvious. Sam Helms and Gerry Williams (1973) partially overcame this obstacle by experimentally exposing high school students to simulated work environments for brief intervals using Krumboltz's Job Experience Kits. The Realistic environment was represented by a kit for Plumber, Investigative by Medical Technologist, Artistic by Designer, Social by Elementary Teacher, Enterprising by Salesperson, and Conventional by Accountant. Each kit provides a work sample presented using a form of programmed instruction in which students solve a problem characteristic of the occupation.

Helms and Williams exposed 157 boys and 120 girls to the work kits and measured their perceived congruency using a specially devised questionnaire in an elaborate repeated measures design. The Conventional personality type was represented by only 7 boys because there were only 7 boys with high point codes for C among the 2,933 students initially tested with the SDS to develop the samples for the experiment. For girls, only the I, A, S, and C personality types were represented because there were not enough girls with R and E high point codes for a meaningful study. The results for boys are illustrated in Figure 17. This figure illustrates a complication in research on congruence that it is apparently easy for researchers to overlook. (It must be easy, because most researchers seem to overlook this problem.) There may be differences in satisfaction levels characteristic of the personality types regardless of environment, and there may be differences in satisfaction (in this case perceived congruence) characterizing the different environments regardless of personality.

Figure 17 is easiest to understand if you search for the highest and lowest scoring person categories within each environmental category. For example, the R individuals

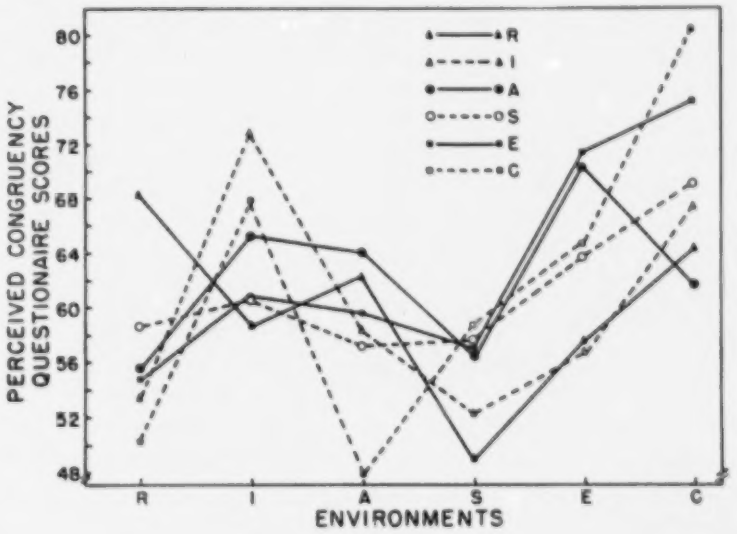
Figure 16.

5-Yr. Categorical Stability of Women Whose Initial Jobs Were of Low, Medium, or High Consistency



Age-consistency subgroup N's range from 128 to 1040

Figure 17.



Boys' Perceptions of Congruency with Environments (Work Kits) According to Personality Types (Highest SDS Score)

Source: Helms & Williams, 1973.

perceive the R environment as more congruent than do any other category of individuals. Likewise the I individuals perceive the I environment as more congruent than do any other category of persons. Figure 18 shows the results for high school girls. Investigative girls perceive the Investigative kit as most congruent; Conventional girls perceived the Conventional environment as most congruent. Notice that all categories of girls perceive the Realistic (plumber) kit as incongruent. This was also true of boys except those classified as Realistic by the SDS.

Studies of employed workers. In one of the most sophisticated studies of the congruence hypothesis, Mount and Muchinsky (1978) found that job satisfaction was found to be related to congruence and also to environment type. In large samples of persons from well defined environments, satisfaction levels differed among environments and personality type, and congruence interacted with environment such that the relation between congruence and satisfaction was stronger--net of personal and environmental type--for certain environmental categories. Their study was an excellent example of an analytical test of the theory, and an antedote for some of the simple-minded tests that ignore the "all other things being equal" provisos. Mount and Muchinsky's results for JDI Total Job Satisfaction are shown in Figure 19.

Spouses or roommates. A number of investigators have illustrated the usefulness of regarding spouses as environments for each other. Wiggins, Moody and Lederer (1983) found that a marital satisfaction measure correlated .7 with a measure of congruence of spouses' VPI codes. Similarly, Bruch, and Skovholt (1985) found that congruence of spouses' Holland types was related to marital satisfaction, and Williams (1967) in an impressive early study found that incongruent roommates may provide an environment for each other conducive of conflict. Although I do not expect many replications of correlations as large as that found by Wiggins et al. (1983), these results suggest that regarding spouses or roommates as environments for each other, and using the classification to predict and understand interactions is a potentially useful application.

Relation to Other Systems

Six studies have examined the relation between the occupational classification and other systems for classifying or analyzing jobs.[7] In the most recent of these, Hyland and Muchinsky (1991) examined the ability of the Position Analysis Questionnaire--a structured worker-oriented job analysis inventory developed by E. J. McCormick and his colleagues--to distinguish Holland occupational categories according to the Dictionary of Holland Occupational Codes for 86 occupations for which PAQ data were available. Eleven of the 13 overall dimension scores from the PAQ significantly distinguished the

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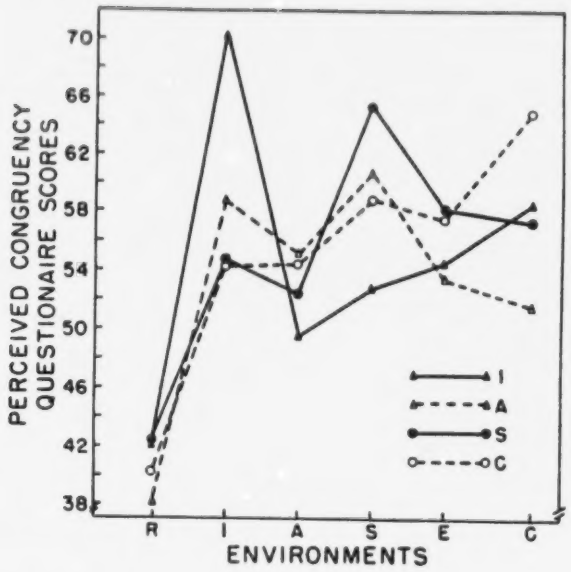
[7]Gottfredson and Holland (1989), L. Gottfredson (1980), Holland et al. (1972), Hyland and Muchinsky (1991), Rounds et al. (1978), Toenjes and Borgen (1974).

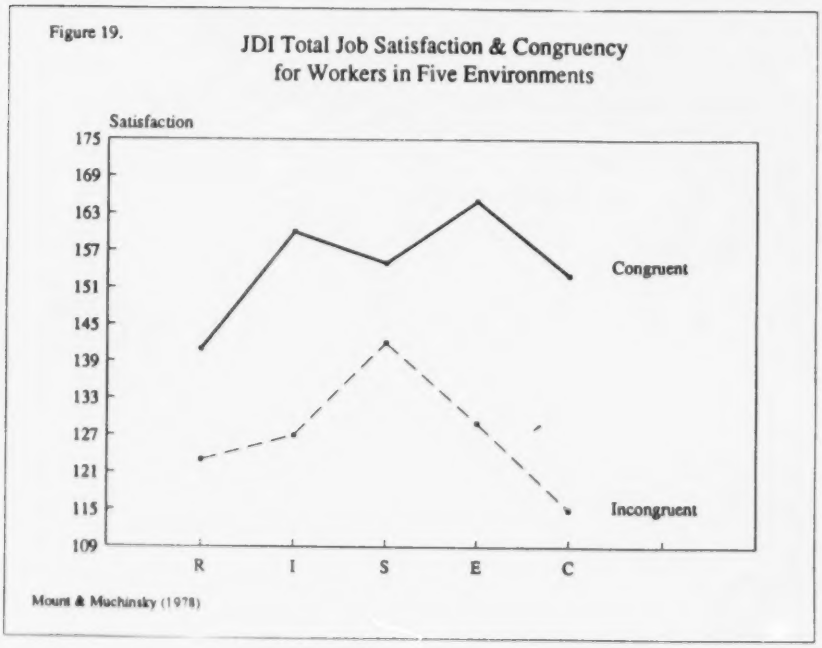
Figure 18.



Girls' Perceptions of Congruency with Environments (Work Kits) According to Personality Types (Highest SDS Score)

Source: Helms & Williams, 1973.

Figure 19.



Holland occupational categories. Table 5 summarizes some of these results by showing mean scores for the first four dimensions of the PAQ by environmental category. Discriminatory functions correctly classified 69 percent of the occupations for which PAQ data were available, kappa = .62.

In a similar classification study as part of the development of the ***Dictionary of Holland Occupational Codes*** Gottfredson and Holland (1989) obtained a hit rate of 88% (kappa = .85) for 189 occupations using the Department of Labor's job analysis system--and a more rectangular distribution of environmental types than examined by Hyland and Muchinsky. In a cross-validation sample where the criterion for environmental classification was simply judgment, job analysis data agreed with judgment 77% of the time (kappa = .47). Similarly, we found that 77% of occupations were classified as expected based on their ***Guide to Occupational Exploration*** interest groups.

Validity of the PCI for Environmental Classification

The most recent method for implementing the occupational-environmental classification is the ***Position Classification Inventory***. The classification of occupations using the PCI should generally agree with prior classifications. Information about agreement is shown in Table 6, which shows the classification of occupations according to PCI high-point code and first-letter code in the DHOC. This table parallels the 6-by-6 table presented earlier. The table illustrates the greater classificatory efficiency observed when multiple profiles per occupation are used. In all, 86 percent of the 49 occupations were classified into the same major Holland category by the PCI and the DHOC ($\kappa = .83$). Off diagonal entries are occupations classified in different ways by the two methods. For example, social psychologist was classified A according to the DHOC (probably an incorrect classification) and I according to the PCI. The degree of agreement represented in the table is very high.

Table 7 shows that as the number of inventories increases, so does the agreement between the PCI and the DHOC classification. Although the number of occupations decreases in analyses involving a larger number of inventories, very high agreement (88% or 89%, $\kappa = .86$ or .87) was obtained when there are eight or more inventories per occupation. Because relatively few DHOC occupations are based on eight or more job analysis schedules (Miller et al., 1980), we assume that the PCI classification of occupations based on ten or more inventories will usually be superior to the DHOC classification.

Classification in Practice

Now I will turn to illustrating some applications of the environmental classification in practice. These include organizing occupational information for vocational explora-

Table 5

Ordering of Environmental Categories on Illustrative PAQ Dimensions

Dimension and Category	Mean
Decision/communication responsibilities	
Enterprising	.65
Artistic	.52
Investigative	.29
Social	.26
Conventional	-.49
Realistic	-.49
Machine/equipment operation	
Realistic	.59
Artistic	.42
Investigative	-.26
Conventional	-.48
Social	-.49
Enterprising	-.63
Clerical related activities	
Conventional	.28
Artistic	-.19
Investigative	-.53
Realistic	-.66
Social	-.68
Enterprising	-.93
Technical related activities	
Investigative	.99
Artistic	.42
Social	-.05
Enterprising	-.06
Realistic	-.15
Conventional	-.44

Table 6

Classification of Occupations According to the Highest Scale of Mean PCI Profile and First-Letter Code According to the DHOC: Occupations for Which at Least 3 Inventories Were Available

PCI highest scale	DHOC First-Letter Code					
	R	I	A	S	E	C
Realistic	**8**	0	0	0	0	0
Investigative	0	**8**	1	0	1	0
Artistic	0	0	**6**	0	0	0
Social	0	1	0	**8**	2	1
Enterprising	0	0	0	0	**6**	1
Conventional	0	0	0	0	0	**6**

Note. Agreement = 86%; $\kappa = .83$; N = 49 occupations.

Table 7

Agreement Between PCI High-Point Code and First-Letter Dictionary of Holland Occupational Code: Occupation-Level Analysis

Number of informants per occupation	Percent agreement	κ	Number of occupations
1 or more	72	.66	78
2 or more	82	.79	57
3 or more	86	.83	49
4 or more	86	.84	44
5 or more	86	.83	42
6 or more	86	.83	42
7 or more	88	.85	40
8 or more	89	.87	37
9 or more	88	.86	34

tion, career development systems, understanding an individual's career problems, and organizing work or aspiration histories to assist in understanding individuals.

Organizing Information

The most straightforward application of the classification is to organize occupational information for vocational assistance. This application is illustrated in the ***Occupations Finder*** (Holland, 1989) used with the SDS assessment which organizes occupational titles according the major categories and subcategories of the classification so that users can explore related groups of occupations. Many counseling or career services organize occupational exploration materials according to the classification by filing materials by category, and the classification is used to provide structure for computerized occupational search programs.

Career Development Systems

In some organizations human resources specialists have established career development programs based on Holland's classification of vocational personalities and work environments. NASA's Career Resource Center (Leibowitz, Farren, & Kaye, 1986) is an example of a career development program structured by the dual classifications. Individuals complete a ***Self-Directed Search*** self-assessment and then search NASA positions, Federal jobs, or occupations in the general U.S. economy classified according to Holland category.

Understanding Job Dissatisfaction or Career Problems

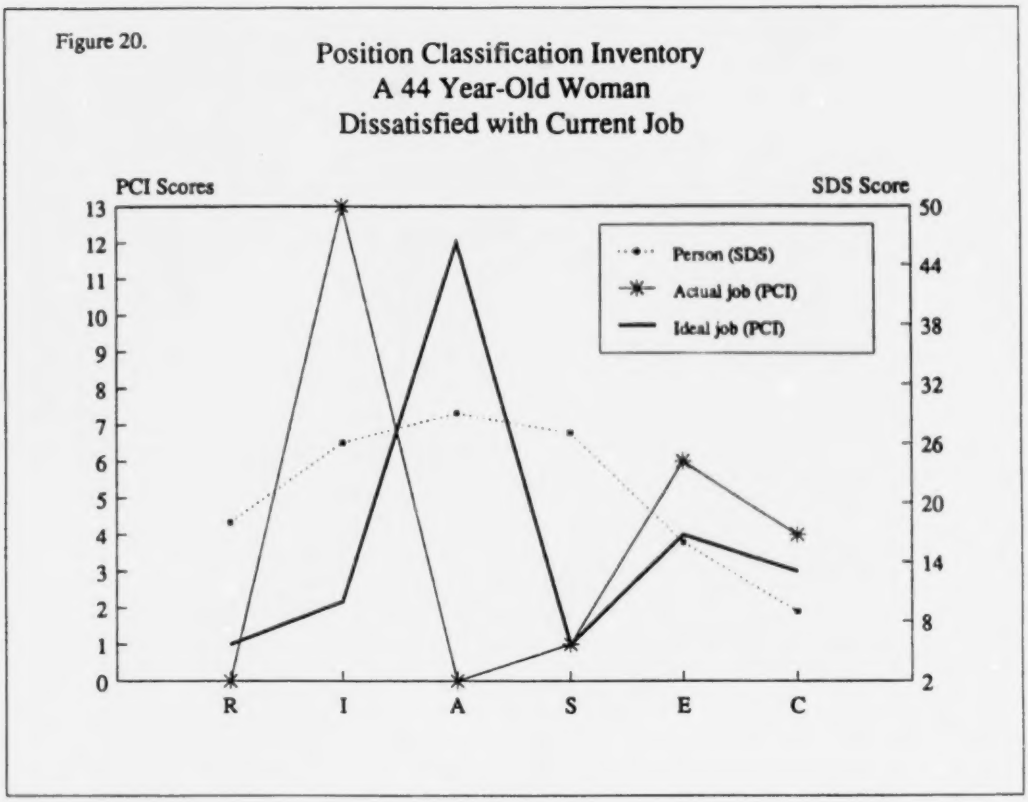
One important use of the environmental classification is the assessment of the congruence between a person and his or her current position. For instance, a description of the job based on the ***Position Classification Inventory*** may be available and the client may have completed the ***Self-Directed Search***, ***Vocational Preference Inventory***, or other inventory intended to measure a person's resemblance to the theoretical personality types. Here is a brief example.

Figure 20 shows the SDS scores (dotted line) for a 44 year-old woman with a Ph.D. in psychology, a career history in program evaluation and social program administration, and who is currently employed as a research scientist at a social science R&D center. She writes poetry, short stories, and novels in her spare time, but hasn't sold any. This is a relatively undifferentiated ASI profile, with the highest three scales nearly tied. An individual with this profile might be congruent with AS, AI, IA, IS, SI, or SA occupations.

This woman completed the PCI to describe her current job, which she dislikes, and her "ideal" job. Both PCI profiles are also shown in Figure 20. The current job produced

a highly differentiated IE profile, and the ideal job produced a well-defined AE profile. The actual-ideal discrepancy in the PCI profiles suggests that an occupation providing more outlet for her artistic and literary proclivities may prove more satisfying. At the same time, the extremely low Artistic score for her current position suggests further exploration. Such a low Artistic score is uncharacteristic of the work of most psychologists. A counselor helping this woman explore alternative routes to career satisfaction might encourage her to consider job redefinition or enrichment within her current position (or another position in the same occupation) as well as to continue to pursue her literary interests outside the current job. She will likely wish to avoid abandoning her established career unless writing ultimately proves to be sufficiently remunerative to allow a radical shift.

Figure 20.



Organizing Work or Aspiration Histories for Prediction and Understanding Individuals

The virtue of the occupational classification is illustrated by its ability to organize simple occupational aspirations to predict subsequent vocational choices. It has long been the received view among psychologists that vocational aspirations have limited value in counseling or other applications (e.g., Clark, 1961; Cronbach, 1949; Darley & Hagenah, 1955; Nunally, 1959) compared to inventoried interests.[8] The received view is in blunt disagreement with the data. Classified occupational aspirations or "daydreams" are more efficient predictors of subsequent vocational choice than any other portion of the Self-Directed Search (Gottfredson & Holland, 1975),[9] and classified occupational aspirations in combination are far more efficient predictors of later choices than are inventoried interests (Holland & Gottfredson, 1975; Holland, Gottfredson, & Baker, 1990). All that was required to reveal the usefulness of expressed choices in counseling and prediction was a valid occupational classification to organize the data.

The utility of classified occupations is illustrated in the example of the dissatisfied psychologist whose SDS and PCI profiles we examine a moment ago. Artistic occupations predominate in the occupational daydreams section of her booklet. Titles listed include researcher (current job), free-lance writer (A), pianist (A), interior designer (A), architect (A), architectural historian (S/A?), English teacher (A), librarian (S), program service planner (E), clinical psychologist (S), and editor(A). Her aspiration history provides support for the interpretation that this is an Artistic individual, an interpretation with which she agrees. Her work history involving social program administration and program evaluation may account for the complexity of her SDS profile.

How the Classification Evolved

Initially an a priori classification (Holland, 1959), the classification of occupations soon came to be inferred from the mean interest patterns of individuals employed in or aspiring to the occupations. For example, the Environmental Assessment Technique (Astin & Holland, 1961) entails using a census of an environment's incumbents to classify an environment according to the distribution of the personality types represented.

Early classifications of occupations were based on Kuder or Vocational Preference Inventory profiles for college students with majors associated with those occupations or

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[8]For example, Kuder (1977) wrote, "The facts are that expressed interests in specific occupations appear to be the least stable of the interests of young people, and that measured interests can yield useful suggestions at an earlier age than would otherwise be the case" (p. 2). Kuder's disparaging view of expressed choices extended even to inventoried preferences for occupations.

[9] Kuder's dim view of *inventoried* occupational preferences is also unsupported. Occupational preferences are useful parts of the Strong, and the occupations section of the Self-Directed Search generates the next most efficient predictions (following classified expressed choices).

Table 8

What is the Code for . . . ?

Occupation	Code
Animal impersonator	AES
Animal treatment investigator	SRE
Apiculturist	IRE
Chef	ESR
Dean of students	SEA
Dog catcher	SER
Hosiery sizer	CRS
Ice-cream decorator	AES
Jelly filter tender	CRS
Lumpia wraper maker	RCE
Lyricist	ASE
Poultry inseminator	RIE
Revenue agent	ERI
Sound cutter	CRS
Rubber goods tester	CRS
Umpire	ESR
Urologist	IRS
Vamp creaser	RSE
Wine steward	ERS

for persons employed in the occupations (Holland, 1966, 1968, 1975; Holland, Krause, Nixon, & Tremblath, 1953). For the occupational classification incorporated in the original Self-Directed Search (Holland, 1972), information from interest assessments for aspirants and incumbents was supplemented with job analysis data derived from the Position Analysis Questionnaire (PAQ; McCormick, Jeanneret, & Mecham, 1972) for 832 occupations. In addition, a cross-walk procedure was developed by Viernstein (1972) for estimating a Holland code based on the Dictionary of Occupational Titles (DOT) classification of occupations (the first three digits of the DOT code). The approximately 500 occupations incorporated in the Occupations Finder accompanying the earlier versions of the Self-Directed Search were classified judgmentally after reviewing VPI, SDS, Kuder, Strong, PAQ, and DOT data.

To extend the Holland occupational classification to the most comprehensive set of occupations possible, we (Gottfredson, Holland, & Ogawa, 1982; Gottfredson & Holland, 1989) have used extensive occupational analysis data for 12,860 occupations. These data, which were developed over the years by the U.S. Department of Labor's occupational analysis program, were used to obtain Holland codes for each occupation empirically.

In the current (1989) edition of the DHOC, all differences between the Dictionary classification and the classification of occupations in the Occupations Finder were resolved. To do so, interest data and judgment were used to override the formula used to assign codes for a small number of occupations (see Gottfredson & Holland, 1989, Appendix V). The Occupations Finder now contains over 1000 occupations classified in the same manner as in the DHOC. The DHOC makes it possible to quickly locate a code even for relatively esoteric occupational titles, as Table 8 makes clear.

The early attempts to implement the environmental typology have provided multiple ways of identifying occupations. Identification is "the allocation or assignment of additional unidentified objects to the correct class, once such classes have been established by prior classification" (Sokol, 1974, p. 1116). Most recently, we developed the PCI as a new method to identify environments according to the classification.

It is somewhat problematical that alternative methods of identification do not always converge on precisely the same result. This problem is illustrated in Table 9. This shows how carpenter and lawyer are identified according to a variety of methods: (a) the initial 1972 version of the Occupations Finder, (b) the Strong-Campbell Interest Inventory (Campbell, 1977), (c) the Career Assessment Inventory (Johansson, 1982), (d) the 1989 DHOC and current version of the Occupations Finder, (e) the DHOC classification based on occupational titles aggregated to the 4-digit Standard Occupational Classification categories, and (f) the PCI based on a number of job analysis inventories. This brief illustration makes clear that different identifications by different methods are to be expected--especially beyond the first letter.

At the moment, there is no clear resolution to the problem of alternative identifications. The codes assigned in the DHOC (and the current version of the Occupations Finder) are the most comprehensive listing possible at this time. These codes should be regarded as approximations, but some are based on only a small number of job analyses using a job analysis instrument that was not tailored to implement the theory. Identification based on job analysis using the PCI will probably produce the most useful identifications for specific occupational environments, although the evidence implies that old and new methods of identifying occupational environments show a high degree of convergence at the one letter level, so that both old and new methods remain useful.

Where to Find Fuller Accounts

For more comprehensive accounts of evidence and applications, researchers and practitioners should consult Holland's (1985a) book and the recent bibliography by Holland and Gottfredson (1990). The professional manual for the ***Position Classification Inventory*** (Gottfredson & Holland, 1991) discusses environmental assessment in more detail, provides further illustrations of practical applications, and covers technical matters not discussed here.

Table 9

Identifications of Some Common Occupations According to Different Methods

	Method					
Occupation	1972 OF	1977 SCII	1982 CAI	1989 DHOC	DHOC SOC	1991 PCI
Carpenter	RCI	R	R	RIE	REI	RCE
Bridge	--	--	--	RES		
Maintenance	--	--	--	REI		
Mold	--	--	--	RIE		
Prototype	--	--	--	RIC		
Railcar	--	--	--	RES		
Rough	--	--	--	RIS		
Ship	--	--	--	REI		
Lawyer	EAS	E	--	ESA	ESA	EIS
Admiralty	--	--	--	ESA	--	--
Corporation	--	--	--	ESA	--	--
Criminal	--	--	--	ESA	--	--
Patent	--	--	--	ESA	--	--
Probate	--	--	--	ESA	--	--
Real estate	--	--	--	ESA	--	--
Offering svcs. to public	--	--	--	--	--	ESI
State employee	--	--	--	--	--	EIA

References

Assouline, M., & Meir, E. I. (1987). Meta-analysis of the relationship between congruence and well-being measures. *Journal of Vocational Behavior, 31*, 319-332.

Astin, A. W., & Holland, J. L. (1961). The environmental assessment technique: A way to measure college environments. *Journal of Educational Psychology, 52*, 308-316.

Borgen, F. H. (1986). New approaches to the assessment of interests. In W. B. Walsh & S. H. Osipow (Eds.), *Advances in vocational psychology. Vol. I: The assessment of interests*, pp. 83-125. Hillsdale, NJ: Erlbaum.

Campbell, D. P. (1977). *Manual for the SVIB-SCII -- Strong-Campbell Interest Inventory* (Form T325, 2nd ed.). Stanford, CA: Stanford University Press.

Clark, K. E. (1961). *Vocational interests of non-professional men.* Minneapolis, MN: University of Minnesota Press.

Cronbach, L. J. (1949). *Essentials of psychological testing.* NY: Harper & Brothers.

Darley, J. G., & Hagenah, T. (1955). *Vocational interest measurement.* Minneapolis, MN: University of Minnesota Press.

Gati, I. (1985). Description of alternative measures of the concepts of vocational interest: Crystallization, congruence, and coherence. *Journal of Vocational Behavior, 27*, 37-55.

Gottfredson, G. D. (1982). An assessment of a mobility-based occupational classification for placement and counseling. *Journal of Vocational Behavior, 21*, 71-98.

Gottfredson, G. D. (1977). Career stability and redirection in adulthood. *Journal of Applied Psychology, 62*, 436-445.

Gottfredson, G. D., & Holland, J. L. (1975). The vocational choices of men and women: A comparison of predictors from the Self-Directed Search. *Journal of Counseling Psychology, 22*, 28-34.

Gottfredson, G. D., & Holland, J. L. (1989). *Dictionary of Holland occupational codes* (2nd ed.). Odessa, FL: Psychological Assessment Resources.

Gottfredson, G. D., & Holland, J. L. (1990). A longitudinal test of the influence of congruence: Job satisfaction, competency utilization, and counterproductive behavior. *Journal of Counseling Psychology, 37*, 389-398.

Gottfredson, G. D., & Holland, J. L. (1991, in press). *Position Classification Inventory professional manual.* Odessa, FL: Psychological Assessment Resources.

Gottfredson, L. S. (1980). Construct validity of Holland's occupational typology in terms of prestige, census, Department of Labor, and other classification systems. *Journal of Applied Psychology, 65*, 697-714.

Helms, S. T., & Williams, G. D. (1973). *An experimental study of the reactions of high school students to simulated jobs* (Report No. 161). Baltimore: Johns Hopkins University, Center for Social Organization of Schools. (ERIC No. ED087882).

Holland, J. L. (1959). A theory of vocational choice. *Journal of Counseling Psychology, 6*, 35-45.

Holland, J. L. (1966). A psychological classification scheme for vocations and major fields. *Journal of Counseling Psychology, 13*, 278-288.

Holland, J. L. (1968). *The ACT guidance profile manual.* Iowa City: American College Testing Program.

Holland, J. L. (1972). *Professional manual for the Self-Directed Search.* Palo Alto, CA: Consulting Psychologists Press.

Holland, J. L. (1973). *Making vocational choices: A theory of careers.* Englewood Cliffs, NJ: Prentice-Hall.

Holland, J. L. (1975). *Manual for the Vocational Preference Inventory.* Palo Alto, CA: Consulting Psychologists Press.

Holland, J. L. (1985a). *Making vocational choices: A theory of vocational personalities and work environments.* Englewood Cliffs, NJ: Prentice-Hall.

Holland, J. L. (1985b). *Manual for the Vocational Preference Inventory.* Odessa, FL: Psychological Assessment Resources.

Holland, J. L. (1985c). *Professional manual for the Self-Directed Search.* Odessa, FL: Psychological Assessment Resources.

Holland, J. L. (1989). *Occupations finder.* Odessa, FL: Psychological Assessment Resources.

Holland, J. L., & Gottfredson, G. D. (1975). Predictive value and psychological meaning of vocational aspirations. *Journal of Vocational Behavior, 6,* 349-363.

Holland, J. L., & Gottfredson, G. D. (1990). An Annotated Bibliography for Holland's Theory of Vocational Personalities and Work Environments. Unpublished manuscript, Johns Hopkins University, Center for Social Organization of Schools, 3505 N. Charles St., Baltimore, MD 21218.

Holland, J. L., Gottfredson, G. D., & Baker, H. G. (1990). Validity of vocational aspriations and interest inventories: Extended, replicated, and reinterpreted. *Journal of Counseling Psychology, 37,* 337-342.

Holland, J. L., Krause, A. H., Nixon, M. E., & Trembath, M. F. (1953). The classification of occupations by means of Kuder interest profiles: I, The development of interest groups. *Journal of Applied Psychology, 37,* 263-269.

Holland, J. L., Viernstein, M. C., Kuo, H., Karweit, N. L., & Blum, Z. D. (1972). A psycyological classification of occupations. *JSAS Catalog of Selected Documents in Psychology, 2,* 84. (Ms. 184).

Hyland, A. M., & Muchinsky, P. M. (1991). Assessment of the structural validity of Holland's model with job analysis (PAQ) information. *Journal of Applied Psychology, 76,* 75-80.

Iachan, R. (1984a). A family of differentiation indices. *Psychometrika, 49,* 217-222.

Iachan, R. (1984b). A measure of agreement for use with the Holland classification system. *Journal of Vocational Behavior, 24,* 133-141.

Iachan, R. (1990). Some extensions of the Iachan congruence index. *Journal of Vocational Behavior, 36,* 176-180.

Johansson, C. B. (1982). *Manual for the Career Assessment Inventory* (2nd ed.). Minneapolis, MN: Interpretive Scoring Systems.

Kellam, S. G., Branch, J. D., Agrawal, K. C. & Ensminger, M. E. (1975). *Mental health and going to school.* Chicago, IL: University of Chicago Press.

Kuder, F. (1977). *Activity interests and occupational choice.* Chicago: Science Research Associates.

Kwak, J. C., & Pulvino, C. J. (1982). A mathematical model for comparing Holland's personality and environmental codes. *Journal of Vocational Behavior, 21,* 231-241.

Leibowitz, Z. B., Farren, C., & Kaye, B. L. (1986). *Designing career development systems.* San Francisco: Jossey-Bass.

McCormick, E. J., Jeanneret, P. R., & Mecham, R. C. (1972). A study of job characteristics and job dimensions as based on the Position Analysis Questionnaire (PAQ). *Journal of Applied Psychology Monograph, 56,* 347-368.

Miller, A. R., Treiman, D. J., Cain, P. S., & Roos, P. A. (Eds.). (1980). *Work, jobs, and occupations: A critical review of the Dictionary of Occupational Titles.* Washington, DC: National Academy Press.

Moody, A. (1983). The compatibility index: Beyond high point codes. *American Mental Health Counselors Association Journal, 5,* 85-89.

Mount, M. K., & Muchinsky, P. M. (1978). Person-environment congruence and employee job satisfaction: A test of Holland's theory. *Journal of Vocational Behavior, 13,* 84-100.

Muchinsky, P. M., & Monahan, C. J. (1987). What is person-environment congruence? Supplementary versus complementary models of fit. *Journal of Vocational Behavior, 31*, 268-277.

Osipow, S. H. (1987). Applying person-environment theory to vocational behavior. *Journal of Vocational Behavior, 31*, 333-336.

Richards, J. M., Jr. (n.d.). Characteristics of U.S., Japanese, and British Commonwealth universities offering education in agriculture. Unpublished manuscript, Johns Hopkins University, Center for Social Organization of Schools.

Roe, A. (1954). A new classification of occupations. *Journal of Counseling Psychology, 1*, 215-220.

Roe, A., Hubbard, W. D., Hutchinson, T., & Batemen, T. (1966). Studies of occupational history. Part I: Job changes and the classification of occupations. *Journal of Counseling Psychology, 13*, 387-393.

Rounds, J. B., Dawis, R. V., & Lofquist, L. H. (1987). Measurement of person-environment fit and prediction of satisfaction in the theory of work adjustment. *Journal of Vocational Behavior, 31*, 297-318.

Rounds, J. B., Jr., Shubsachs, A. P. W., Dawis, R. V., & Lofquist, L. H. (1978). A test of Holland's environmental formulations. *Journal of Applied Psychology, 63*, 609-616.

Schneider, B. (1987a). The people make the place. *Personnel Psychology, 40*, 437-453.

Schneider, B. (1987b). E = f(P,B): The road to a radical approach to person-environment fit. *Journal of Vocational Behavior, 31*, 353-361.

Sokol, R. R. (1974). Classification: Purposes, principals, progress, prospects. *Science, 185*, 1115-1123.

Spokane, A. R. (1985). A review of research on person-environment congruence in Holland's theory of careers [Monograph]. *Journal of Vocational Behavior, 26*, 306-343.

Swaney, K., & Prediger, D. (1985). The relationship between interest-occupation congruence and job satisfaction. *Journal of Vocational Behavior, 26*, 13-24.

Toenjes, C. M., & Borgen, F. H. (1974). Validity generalization of Holland's hexagonal model. *Measurement and Evaluation in Guidance, 7*, 79-85.

Viernstein, M. C. (1972). The extension of Holland's occupational classification to all occupations in the Dictionary of Occupational Titles. *Journal of Vocational Behavior, 2*, 107-121.

Wiggins, J. D., Moody, A. D., & Lederer, D. A. (1983). Personality typologies related to marital satisfaction. *American Mental Health Counselors Association Journal, 6*, 169-178.

Zener, T. B., & Schnuelle, L. (1976). Effects of the Self-Directed Search on high school students. *Journal of Counseling Psychology, 23*, 353-359.